

A NEW SPECIES OF *HALIOTIS* (*MARINAURIS*) (MOLLUSCA) FROM THE EARLY MIOCENE OTAUA GROUP, NORTHLAND, NEW ZEALAND

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Abstract. A new species of gastropod mollusc, *Haliotis* (*Marinauris*) *matihetiensis*, is described from the early Miocene Otua Group, at Matihetihe, West Hokianga, Northland. It is the first New Zealand haliotid to be assigned to the subgenus *Marinauris*. It is the fifth fossil haliotid described from New Zealand, four of which are of Otaian age. The new species has affinities with African and Australian haliotids, suggesting palaeodistribution via the circumpolar Antarctic Current.

KEYWORDS: Palaeontology; fossil; mollusc; haliotid; early Miocene.

INTRODUCTION

A nearly complete shell of a new species of prosobranch gastropod was collected on 29 September 1996 from a roadside exposure on the east side of the Matihetihe Hill south-east of Mitimiti, north-west Hokianga Harbour, Northland. The specimen had been naturally excavated by rainfall from soft, weathered siltstone, and left exposed on the surface.

GEOLOGICAL SETTING (Fig. 1)

The fossil locality at Matihetihe Hill (early Miocene Waititi Formation (Ballance *et al.* 1977), Otua Group) is composed of interbedded, highly weathered tuffaceous grits and grey calcareous pebbly sandstone. Irregular bands of siltstone (10 mm thick) and pebbly sandstone (60–80 mm thick) contain occasional carbonaceous fragments and shell hash forming lenses a few centimetres long. The formation is up to 300 m thick in the vicinity of the fossil locality, which is approximately 0.5 km east of a highly fossiliferous volcanoclastic mass flow deposit (Milligan 1959). Whole mollusc shells are uncommon. They are mainly small nuculid and nuculanid bivalves and occasional gastropods. These and other marine invertebrates represent sub-tropical faunas (Squires 1958, Milligan 1959).

SYSTEMATICS

CLASS:	GASTROPODA Cuvier, 1797
SUBCLASS:	PROSOBRANCHIA Milne-Edwards, 1848
ORDER:	ARCHAEOGASTROPODA Thiele, 1925
SUBORDER:	PLEUROTOMARIINA Cox & Knight, 1960
SUPERFAMILY:	PLEUROTOMARIACEA Swainson, 1840
FAMILY:	HALIOTIDAE Rafinesque, 1815

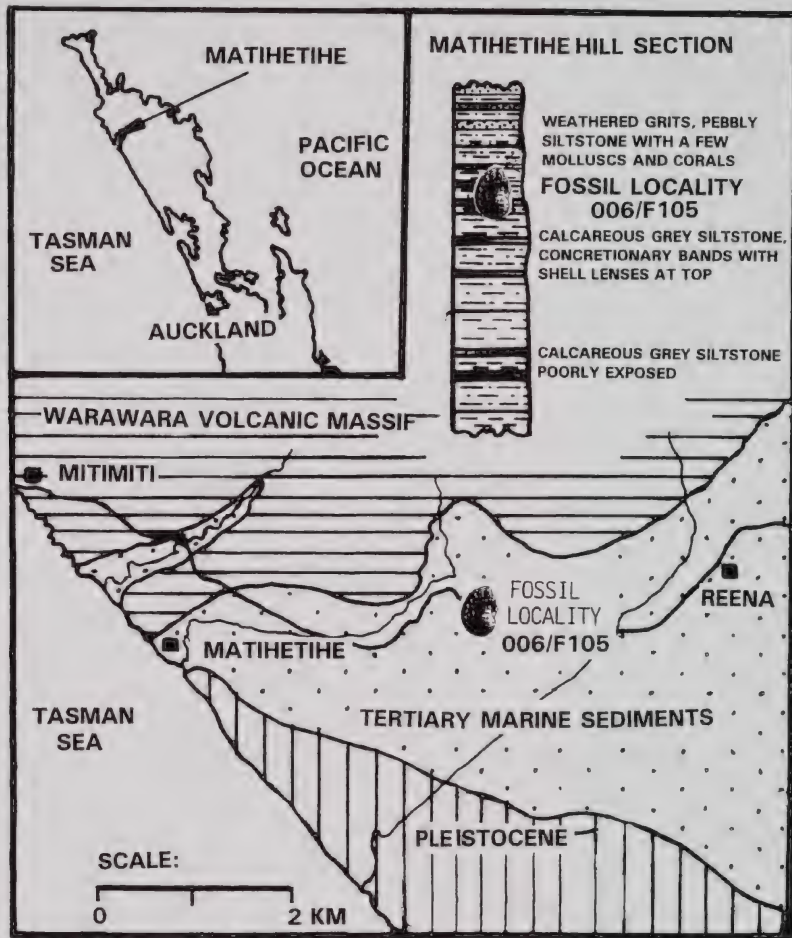


Fig. 1. Location map and stratigraphic column of the Matihetihe Hill section, showing details of the early Miocene fossil type locality 006/302388 (f105).

GENUS: *Haliotis* Linnaeus, 1758

Type species: *Haliotis asinina* Linnaeus, 1758 (by subsequent designation, Denys de Monfort, 1810; Recent, Indo-Pacific).

Diagnosis: Shell auriform, asymmetrical, with low or raised spire situated more or less off-centre or sub-central posteriorly; concave ramp with spiral row of closed and open exhalant respiratory tremata along left side; columella forming a wide, usually flat, ramp around left side and joining basal lip, sometimes with flange; no operculum.

SUBGENUS: *Marinauris* Iredale, 1927

Type species: *Marinauris melculus* Iredale, 1927 (by subsequent designation, Wenz, 1938; Recent, Queensland, Australia).

Diagnosis: Shell small, roundly ovate; tremata orifices large on conical projections separating upper whorl surface from concave outer face; at least six tremata open; no raised axial lamellae;

dorsal rib weak; labial area not forming a projecting flange, outer edge of labial area forms shell periphery; ornament of numerous fine spiral cords crossed by very fine striae on abapical side of tremata or on entire surface; last whorl within submarginal apex; apex not strongly eccentric.

Haliotis (Marinauris) matihetiensis n. sp. (Figs 2-6)

MATERIAL

Holotype. AK73135 (Auckland War Memorial Museum); specimen filled with sandstone matrix with portion of anterior apertural lip missing.

TYPE LOCALITY

Fossil Record File number 006/f105; grid reference 006/302388 (1989, NZMS 260, 1:50 000 map); Matihetihe Hill road cut on south side of road, 2.5 km east of Matihetihe, north-west Hokianga, Northland.

DESCRIPTION OF HOLOTYPE

Shell small, roundly ovate, low; columellar flange below spire; spire nucleus low, sub-central; apex not strongly eccentric, teleconch of 2 whorls obtusely angled below spire nucleus; subdued convex sutural whorl ramp joins curved median carina outside trematal line; smooth carinal cord lies immediately below trematal line; labial area does not form projecting flange, rounded, smooth; width of labial lip ventral margin increases anteriorly with broad, smooth furrow; penultimate whorl spiral coiled open; abraded surface lacking axial costae, spiral cords, prosocline plicae; two worn, broadly-rounded spiral dorsal ribs, first at mid-sutural ramp, second adjacent to trematal line on periphery of sutural ramp; tremata about 19, large, truncated conical, with proportionately large orifices, total extend from upper suture to angulation on last whorl; 12 or more tremata open; space between tremata concave, smooth. DIMENSIONS: Maximum diameter 9.6 mm; minor diameter 6.4 mm; height 3.1 mm.

AGE

Otaian (Aquitanian), early Miocene (Ballance *et al.* 1977).

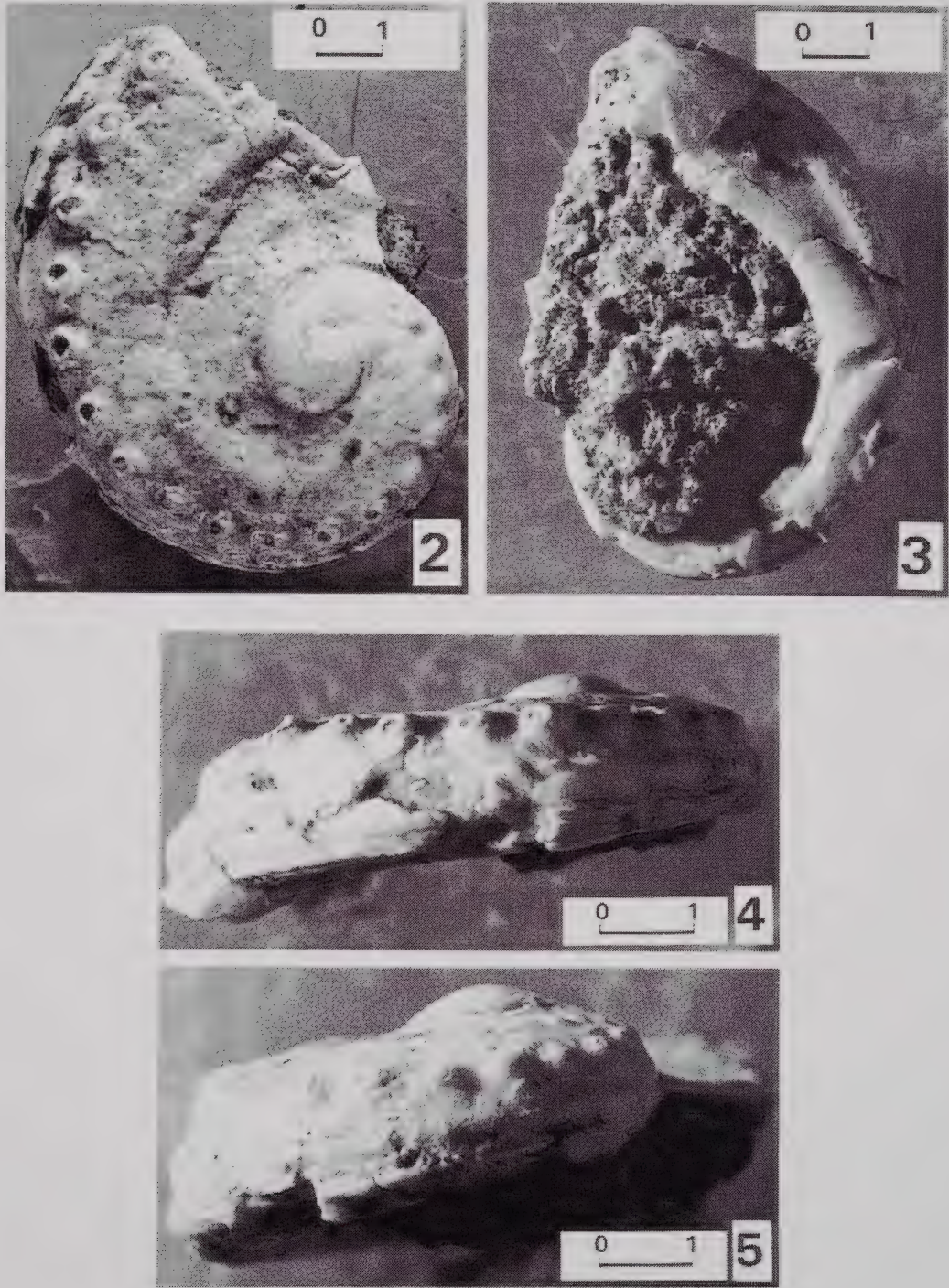
ETYMOLOGY

Named after the type locality, Matihetihe.

REMARKS

The small size of the unique specimen indicates a juvenile. However, the number of tremata and a reconstructed basal flange and apertural lip, suggest a sub-adult. The species in the subgenus tend to be small. The new species is placed in the subgenus *Marinauris* because the apex is not strongly eccentric, there is no angulation at the tremata row, the tremata are proportionately large and there is a spiral cord ornament on the abapical side of the tremata.

The following characters differentiate *H. (Marinauris) matihetiensis* from other fossil or Recent haliotids: apex not strongly eccentric; possession of a reduced, low spire; lack of spiral cords, axial costae and prosocline growth plicae; possession of one pronounced and one weak dorsal rib and a spiral carinal cord immediately below the trematal line; large number of open tremata; possession of an anteriorly widening basal labial flange restricting apertural size; dorsal outer lip embayed at the intersection of the penultimate body whorl; and minor peribasal angle.



Figs 2-5. Holotype of *Haliotis (Marinauris) matihetihensis* AK73135. 2. Dorsal. 3. Ventral. 4. Anterior edge. 5. Posterior edge. Scale = 1 mm.



Figs 6-11. Illustrations (dorsal views) of fossil New Zealand *Haliotis*. Not to scale. 6. *H. (Marinauris) matihetihensis* n. sp. 7. *H. (Notohaliotis) waitemataensis*. 8. *H. (Paua) flemingi*. 9. *H. (Euhaliotis) mathesonensis*. 10. *H. (Sulculus) powelli*. 11. *H. (?Notohaliotis)* sp. [Figs 6-9 by the author; Figs 10-11 from Beu *et al.* (1990).]

Four other extinct New Zealand haliotids have been described. *Haliotis (Notohaliotis) waitemataensis* Powell, 1938 (Fig. 7). *H. (Paua) flemingi* Powell, 1938 (Fig. 8) and *H. (Euhaliotis) mathesonensis* Eagle, 1996 (Fig. 9) are recorded as Early Miocene (Otaian Stage). *H. (Sulculus) powelli* Fleming, 1952 (Fig. 10) is recorded from the Late Pleistocene (Castlecliffian Stage). These and an undescribed species of *Haliotis* (*?Notohaliotis*) (Beu *et al.* 1990; Fig. 11) from the Late Oligocene (Duntroonian/Waitakian Stages), Cookson Volcanics, South Island, differ from *Haliotis (Marinauris) matihetihensis* in having: a prominent sculpture of spiral cords marking the keel on the whorl sides and traversing the sutural ramp; short, open spines or scales where spiral cords cross the axial plicae; a smooth, moderately wide basal flange; the space between the tremata and the lower margin of the shell spirally ribbed instead of smooth; and strong irregularly arcuate forwardly-directed radial folds.



Figs 12–18. Illustrations (dorsal views) of fossil and Recent *Haliotis*. Not to scale. 12. *H. palaea*. 13. *H. (Marinauris) parva*. 14. *H. (Marinauris) mooraboolensis*. 15. *H. (Marinauris) roei*. 16. *H. (Marinauris) brazier*. 17. *H. (Marinauris) hargravesi*. 18. *H. (Marinauris) melculus*. [Fig. 12 from Woodring (1931); Figs 13 and 15 from Van Nostrand (1956); Fig. 14 after Smith (1967); Figs 16–18 by the author.]

The imperfect internal cast described as *H. iris* Martyn, 1784 from Cape Rodney, North Island, New Zealand (Harris 1897; Suter 1913), is not the Recent *H. (Paua) iris* Gmelin, 1791 nor is it *H. matihetihensis*. The specimen, G.9549, in Sir James Hector's Collection, Natural History Museum (London), could belong to any of the four Otaian Stage fossil haliotids, or to another undescribed species.

H. (Marinauris) matihetihensis differs from the late Miocene *H. palaea* Woodring, 1931 of California (Fig. 12), by not possessing a deep narrow groove between the exhalant tremata and shell edge and by not having strong spiral cords intersecting weak axial striae on the sutural ramp.

H. (Marinauris) matihetihensis is similar in shape and shell morphology to the Recent *H. (Marinauris) parva* Linnaeus, 1758 of south-eastern Africa (Fig. 13), but differs in not having an ornament of spiral cords on the abapical side of the tremata on the sutural ramp. *H. (Marinauris) parva* has only six open exhalant tremata and lacks growth folds. It has a more reduced peribasal angle, and a more depressed spire with a less eccentric apex, than does *H. (Marinauris) matihetihensis*.

At least 23 Recent species of *Haliotis* (Wilson *et al.* 1993) and various fossil species (Darragh 1970) occur in Australia. The following Australian species are the most similar to *H. (Marinauris)*

matihetihensis. *H. (Marinauris) mooraboolensis* McCoy, 1876 (Victoria, Miocene, Fig. 14), differs from *matihetihensis* by having prominent, evenly spaced, low, spiral ribs over the whole upper surface and a less depressed spire. *H. (Marinauris) roei* Gray, 1826 (Western Australia and Victoria, Recent, Fig. 15), differs from *matihetihensis* by having an upper surface ornament of strong imbricate cords of variable width; fine, axial growths; and only seven open tremata. *H. (Marinauris) brazieri* Angus, 1869 (south-east Australia, Recent, Fig. 16), is dissimilar to *matihetihensis* in that it has a high, subcentral spire, incised spiral lines each side of a central dorsal rib, growth folds and four open tremata. *H. (Marinauris) hargravesi* Cox, 1869 (eastern Australia, Recent, Fig. 17), differs from *matihetihensis* by possessing a slightly concave, broadly excavated, sutural ramp; transversely striate, weakly nodulose ribs on the lower outer side; growth folds; and 11 open tremata. *H. melculus* Iredale, 1927 (Queensland, Recent, Fig. 18), possesses an elevated spire; sculpture of numerous narrow, flat-topped, spiral ribs of irregular size crossed by sharp, crescentic transverse ridges with transverse striae in the interspaces; and four open tremata.

An undescribed, internal cast of a Miocene *Haliotis* from New Caledonia lodged in the University of Auckland, Geology Department, differs from *H. (Marinauris) matihetihensis* in lacking a dorsal rib on the sutural ramp, having a higher spire, and being much larger.

DISCUSSION

Rocky shore facies and their fossils are rarely preserved because of the high energy of such biotopes (Lee *et al.* 1983; Beu *et al.* 1990; Eagle *et al.* 1995). Aragonitic, auriform haliotid shells are fragile and are usually shattered by strong current and wave action. Fossil haliotids usually delaminate or are crushed by the compaction effects of sediment deposition. The result is a poor haliotid fossil record (Woodring 1931; Powell 1938).

Haliotids possess many "primitive" morphological characteristics (Abbott 1976; Abbott & Dance 1980). The oldest recognised fossil haliotids are the Late Cretaceous specimens of *H. (Paua) loamaensis* Anderson, 1902 of California, U.S.A., and *H. (Padollus) antillensis* Sohl, 1992 of Puerto Rico and Jamaica. DNA speciation models (Hara & Fujio 1992; Brown 1993; Lee & Vacquier 1995) support divergence of modern South Pacific haliotids from a common ancestor during the Palaeocene to Oligocene, splitting into a number of descendant populations within distinct palaeogeographic realms. The archaic *H. (Paua) loamaensis* is similar to the extant New Zealand *H. (Paua) iris* Gmelin, 1791 and DNA evidence indicates that the latter is the most archaic of all Recent haliotids (Lee & Vacquier 1995). Later haliotid radiations perhaps originated from an ancestor of *H. (Paua) iris*. Such an ancestor may have been common to various fossil Miocene species now found in California, Japan, Australia, New Zealand, Europe, Cyprus and Asia Minor (Hertlein 1937; Lindberg 1992).

Although haliotid DNA research is confined to Recent species, results confirm that the Haliotidae is monophyletic. It is possible that Miocene species such as *H. (Marinauris) matihetihensis* were part of local radiations that resulted from the global spread of *Haliotis*. *Marinauris* has been omitted from DNA research; allocation to the subgenus is based on shell morphology.

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